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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/896,798

06/29/2001

Jiebo Luo

83025THC

8281

7590

01/12/2005

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EXAMINER

THOMPSON, JAMES A

ART UNIT

PAPER NUMBER

2624

DATE MAILED: 01/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/896,798

Applicant(s)

LUO ET AL.

Examiner

James A Thompson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 June 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2. Claim 12 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 12 recites a "computer program product" but does not recite any elements or means by which said computer program product is physically embodied. Therefore, claim 12 is not a process, machine, article of manufacture, or composition of matter, and is thus directed to non-statutory subject matter. Please refer to MPEP §2106.IV.B.1.(a).

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-2 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Murayama (US Patent 5,936,684).

Regarding claims 1 and 12: Murayama discloses determining M reconstruction levels ($M < N$) based on the gray level distribution of the N level image (figure 4 and column 9, lines 34-39 of Murayama); and applying multilevel dithering to the N level digital image using the M reconstruction levels to produce

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the M level digital image (figures 8-9 and column 12, lines 58-62 of Murayama).

Further regarding claim 12: Murayama discloses that the multitone processing method is performed using a computer program (column 14, lines 63-67 of Murayama).

Regarding claim 2: Murayama discloses performing a K-means clustering operation on the N level digital image, wherein $K=M$ (column 8, lines 37-43 of Murayama). The number of cumulative pixels for increasing brightness in the histogram (figure 2b of Murayama) are used to determine the threshold values (column 8, lines 39-43 of Murayama). The total number of cumulative pixels are divided by the number of levels (M, or n in Murayama) that are used for the image reconstruction (column 8, lines 37-38 of Murayama), and thus the number of clusters (K) is equal to the number of reconstruction levels (M).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murayama (US Patent 5,936,684) in view of Ishiguro (US Patent 6,501,566 B1).

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Regarding claim 3: Murayama discloses forming a histogram of the N level digital image (figure 2a and column 7, lines 26-31 of Murayama).

Murayama does not disclose expressly locating M levels corresponding to the M most prominent peaks in the histogram.

Ishiguro discloses locating M levels (denoted by N is Ishiguro (column 3, lines 24-25 of Ishiguro)) corresponding to the M most prominent peaks in the histogram (figure 7 and column 7, lines 23-26 and lines 59-65 of Ishiguro). A histogram is created (figure 7 and column 7, lines 23-26 of Ishiguro) which set the pixel reference levels based on the number of pixels with densities within a set range (figure 7 and column 7, lines 59-65 of Ishiguro). As can clearly be seen from figure 7 of Ishiguro, this results in the four density levels (S0 to S3) corresponding to the four most prominent peaks in the histogram. This is further evidenced by the language of claim 14 of Ishiguro (column 10, lines 57-60 of Ishiguro).

Murayama and Ishiguro are combinable because they are from the same field of endeavor, namely digital image binarization. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to set the M levels ($M < N$), taught by both Murayama and Ishiguro, based on the M most prominent peaks of said histogram, as taught by Ishiguro. The motivation for doing so would have been to prevent degradation of the image quality when error diffusion is performed, which is a common result for predetermined threshold values (column 2, lines 57-65 of Ishiguro). Therefore, it would have been obvious to combine Ishiguro with Murayama to obtain the invention as specified in claim 3.

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Regarding claims 4-6: Murayama does not disclose expressly that the first and last levels of the M levels are predetermined, wherein the first level is zero and the last level is the maximum possible level.

Ishiguro discloses that the first and last levels of the M levels are predetermined, wherein the first level (S0) is zero and the last level (S3) is the maximum possible level (figure 7; column 7, lines 24-26 and column 8, lines 31-34 of Ishiguro).

Murayama and Ishiguro are combinable because they are from the same field of endeavor, namely digital image binarization. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to preset the first level to zero and the last level to the maximum possible level, as taught by Ishiguro. The suggestion for doing so would have been that halftone text data, which has lot of dark pixel surrounded by light pixels, is a common feature in images (column 2, lines 61-63 of Ishiguro). This produces the peaks at the low density end and high density end of the histogram, such as shown in figure 7 of Ishiguro. Thus, the first and last levels should be set to zero and the maximum possible level, respectively. Therefore, it would have been obvious to combine Ishiguro with Murayama to obtain the invention as specified in claims 4-6.

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murayama (US Patent 5,936,684) in view of Eschbach (US Patent 5,565,994).

Regarding claim 7: Murayama does not disclose expressly that the N-level digital image has multiple channels and the K-means clustering and multi-level dithering is performed on each of the multiple channels independently.

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Eschbach discloses an N-level digital image (column 4, lines 18-20 of Eschbach) which has multiple channels (column 4, lines 21-24 of Eschbach), wherein said multiple channels are processed independently (column 4, lines 23-25 of Eschbach).

Murayama and Eschbach are combinable because they are from the same field of endeavor, namely digital image data halftoning. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use multiple channel image data, as taught by Eschbach, upon which to perform K-means clustering and multi-level dithering, as taught by Murayama, with each channel being processed independently, as taught by Eschbach. The motivation for doing so would have been that independent (column 1, lines 32-35 of Eschbach), separated primary color channels are necessary for the production of digital color images (column 1, lines 24-31 of Eschbach). Therefore, it would have been obvious to combine Eschbach with Murayama to obtain the invention as specified in claim 7.

8. Claims 8 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murayama (US Patent 5,936,684) in view of Eschbach (US Patent 5,565,994) and Klassen (US Patent 5,621,546).

Regarding claim 8: Murayama does not disclose expressly that the N-level digital image has multiple channels and the K-means clustering is performed in the multi-channel space and multi-level vector dithering is used.

Eschbach discloses an N-level digital image (column 4, lines 18-20 of Eschbach) which has multiple channels (column 4, lines 21-24 of Eschbach).

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Murayama and Eschbach are combinable because they are from the same field of endeavor, namely digital image data halftoning. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use multiple channel image data space, as taught by Eschbach, upon which to perform K-means clustering and multi-level dithering, as taught by Murayama, with each channel being processed independently, as taught by Eschbach. The motivation for doing so would have been that independent (column 1, lines 32-35 of Eschbach), separated primary color channels are necessary for the production of digital color images (column 1, lines 24-31 of Eschbach). Therefore, it would have been obvious to combine Eschbach with Murayama.

Murayama in view of Eschbach does not disclose expressly that multi-level vector dithering is used.

Klassen discloses performing multi-level vector dithering (column 4, line 66 to column 5, line 3 of Klassen). Multi-level vector error diffusion (column 4, line 66 to column 5, line 3 of Klassen) is a form of multi-level vector dithering.

Murayama in view of Eschbach is combinable with Klassen because they are from the same field of endeavor, namely digital image data halftoning. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to specifically perform multi-level vector dithering, as taught by Klassen, as said multi-level dithering process. The motivation for doing so would have been to consider the effects of the interactions between dot patterns of different color components (column 3, lines 21-27 of Klassen). Therefore, it would have been obvious to combine Klassen with Murayama in view of Eschbach to obtain the invention as specified in claim 8.

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Regarding claims 10 and 11: Murayama in view of Eschbach does not disclose expressly that the multi-level dithering is vector error diffusion.

Klassen discloses performing vector error diffusion (column 4, line 66 to column 5, line 3 of Klassen).

Murayama in view of Eschbach is combinable with Klassen because they are from the same field of endeavor, namely digital image data halftoning. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to specifically perform vector error diffusion, as taught by Klassen, as said multi-level dithering process. The motivation for doing so would have been to consider the effects of the interactions between dot patterns of different color components (column 3, lines 21-27 of Klassen). Therefore, it would have been obvious to combine Klassen with Murayama in view of Eschbach to obtain the invention as specified in claims 10 and 11.

9. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murayama (US Patent 5,936,684) in view of Klassen (US Patent 5,621,546).

Murayama does not disclose expressly that the multi-level dithering is vector error diffusion.

Klassen discloses performing vector error diffusion (column 4, line 66 to column 5, line 3 of Klassen).

Murayama and Klassen are combinable because they are from the same field of endeavor, namely digital image data halftoning. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to specifically perform vector error diffusion, as taught by Klassen, as said

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multi-level dithering process. The motivation for doing so would have been to consider the effects of the interactions between dot patterns of different color components (column 3, lines 21-27 of Klassen). Therefore, it would have been obvious to combine Klassen with Murayama to obtain the invention as specified in claim 9.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A Thompson whose telephone number is 703-305-6329. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K Moore can be reached on 703-308-7452. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James A. Thompson
Examiner
Art Unit 2624

JAT
07 January 2005



THOMAS D
LEE
PRIMARY EXAMINER